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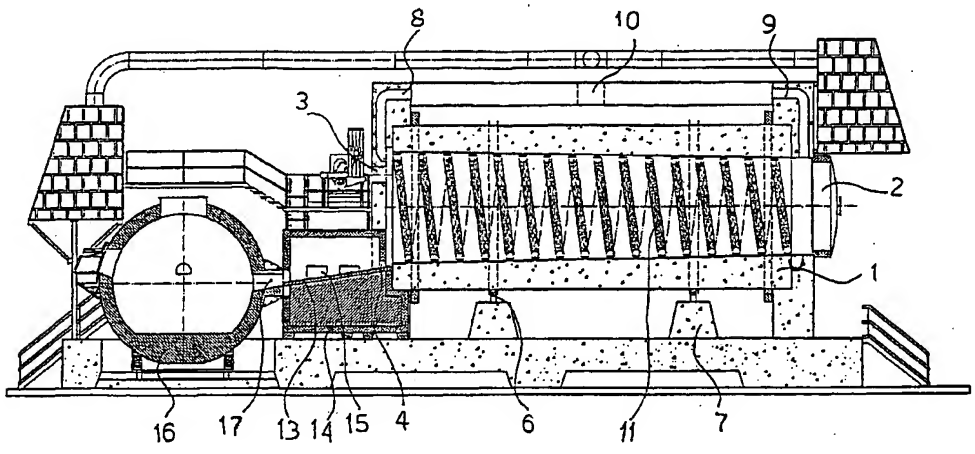
(54) Title: PLANT WITH ROTATING FURNACE FOR THE MELTING WITHOUT SALT OF ALUMINIUM WITH SCREENING AND RECOVERY OF THE SLAGS



(57) Abstract: Plant for the melting of primary and secondary aluminium, provided with a rotating furnace, internally equipped with a spiral element (11), that realizes the melting of the aluminium not using a salty bath, in association with a channel of pouring (13) sets among the hole (4) of the rotating furnace and the spherical store basin (16) positioned on a lower plan, in a pit, and equipped with a rotating joint (17) that realizes a continuity of inclination with the channel of pouring (13) so that is obtained the direct and continuous flow of the fused metal in the store tank without interruption of the process of melting. The plant is also equipped with an automatic and continuous system of selection and recovery of the slag of fusion integrated in the same plant and a double system of canalization of the gases that allows a good cleaning of the pollutant agents and a remarkable energetic conservation in the furnace of melting.

WO 2004/063653 A1

Description

PLANT WITH ROTATING FURNACE FOR THE MELTING WITHOUT SALT OF ALUMINIUM, WITH SCREENING AND RECOVERY OF THE SLAGS

Technical field

Object of the present invention is a modular plant for the melting of metallic materials, especially aluminium scraps, comprising a rotating furnace characterized by the lack of use of a salty bath, and with direct poured of the melted metal in a spherical store tank, an equipment for the selection and recovery of the slag of fusion and a system of scavenging.

State of the art

As it is known, the melting of the aluminium scraps, for the production of ingots for alloys, and also the remelting of the same aluminium ingots is realized in the rotating furnaces, also called salty bath furnaces, in which the sea salt (usually mixed with carbonate of soda, salnitro and yellow prussiato of potassium) is melted by the heat produced in the furnace.

Salt is a good receiver and transmitter of heat and its addition is useful as cover agent to prevent the oxidation of the metal in fusion. At almost 1000°C it reacts englobing the slag of fusion of the aluminium scraps. The principal drawback of these furnaces is the production of a notable quantity of refusals, essentially constituted by the salty products mixed to the slag of the process of fusion of the aluminium scrap. It originates therefore problems because of the disposal of these refusals and not always

the recycling of these refusals is possible and convenient from an economic point of view, because it engraves in notable way on the final price of the ingot of aluminium.

Scope of the invention

The principal scope of the present invention is to avoid the drawbacks of the preceding plants realizing mainly a rotating furnace for the fusion of primary and secondary aluminium that does not have to realize the fusion of the aluminium using a salty bath.

Other scope of the present invention is to realize a rotating furnace for the fusion of the primary and secondary aluminium, according with the preceding purposes, in which it is the direct and continuous pouring of the fused metal in a spherical store tank without any interruption of the process of fusion, so that to improve the use of fuel, of workforce, of salty materials, and the safety conditions of the job.

Other scope of the present invention is to get a plant of fusion of the aluminium according with the preceding purposes, that directly has an automatic and continuous system of selection and recovery of the slag of fusion integrated in the same plant, without necessity of following treatments in different places, so that to realize advantages in terms of costs related to the disposal of slag or its recycling.

Other scope of the present invention is to get a plant of fusion of the aluminium for the production of ingots for foundry, according with the preceding purposes, completely modular, such that the various units, putable on track, are separable to make easy both the construction and the assemblage of them, and the maintenance and the substitution because of usury.

Other scope of the present invention is to get a plant of fusion of the aluminium for the production of ingots for foundry, according with the preceding purposes, having a

system of scavenging that allows a smaller waste of thermal energy in the furnace of fusion and simultaneously a cleaning in the gases from the heavy pollutants before the stack and quality of the air breathed by the employees in the plant decidedly improved in comparison to the preceding plants.

Description of the drawings and way of realizing the invention

Further characteristics and advantages of the invention will result more clear from the following description and from the attached drawings, furnished to only indicative purpose and not limitative.

The fig. 1 shows, in a three-dimensional way, the general view of the system of fusion according to the present invention.

The fig.2 shows, in perspective section, the general view of the system of fusion according to the present invention.

The fig. 3 shows a longitudinal section of the general view of the system of fusion according to the present invention.

The fig. 4 shows, schematically and in a lateral point of view, a portion of the spiral element with the channels realized on it.

The fig. 5 shows, in a lateral longitudinal view, the equipment of treatment of the slag with the disposition for the scavenging and the tracks of moving.

The fig. 6 shows, schematically and in a general view, some component of the plant, mainly the store tank of the fused metal and the system of scavenging.

Accordingly to the drawings, the furnace that realizes the fusion of the primary and secondary aluminium (scraps), is constituted by a cylindrical hollow body (1), with circular section, built in refractory material, resistant to the thermal stress; on an

extremity the body (1) is closed by a porthole (2) used for the loading of the metallic scraps; on the other extremity it is the window of entry (3) of the flame of heat of the scrap and downward the hole (4) for the leakage of the fused liquid that, as illustrated by the drawings, is realized in a plain slot.

The inside diameter of the body (1) changes constantly along its longitudinal axle to originate a negative inclination on the horizontal line beginning from the extremity where is the loading porthole (2) up to the extremity where is positioned the hole (4) of leakage of the melted metal. The difference of inclination among the two extremities in comparison to the horizontal line is 2 centimetres for linear meter of the length of the furnace.

The furnace is covered by a metallic structure and is kept in horizontal position by metallic traverse frames (5) that place and creep on the slides (6) held on the metallic supports (7). On both the left and right extremities of the body (1) are the openings (8) and (9) for the scavenging of the fumes that join in a single channel of evacuation (10).

On the surface of the inside wall of the body (1) and along all its length, it is a spiral element (11), whose spires, in a first favourite and illustrated shape, are cylindrical, with circular section, with constant diameter and built in refractory material resistant to the heat and to the mechanical stress due to the action of the scrap in fusion. On the spires of the spiral element (11) and in the bottom side close to the wall of the cylinder body (1) are a multiplicity of galleries or channels (12) with a favourite semicircular section.

A channel of pouring (13), realized with a suitable inclination and adequately contained in an box (14) insulated and equipped with a window (15), is placed among the hole (4) and the spherical storage basin (16) positioned on a lower plan in a pit. The basin (16) has adequately been described and claimed in the patent WO 02/39044 by

the same applicant. The rotating joint (17), in comparison to that described in the aforesaid patent, has a different shape, so that to realize a continuity of inclination with the channel of pouring (13).

The principal characteristics of a preferred example of realization of the rotating furnace, for the fusion of the primary and secondary aluminium, are the followings:

external diameter: 500 centimetres

inside diameter: 320 centimetres

thickness of the refractory cement: 90 centimetres

length of the cylinder: 1200 centimetres

inclination for the pouring: 24 centimetres

working temperature: 750 - 800 °C

feeding: methane, oil

heat consumption: 750 Kcal/h for Kg/liquid aluminium produced

The furnace is maintained in a slow rotation, from one to four revolution/minute, on its mean axle by a gear motor.

Description of the process of fusion

If the melting of secondary aluminium is preferred, at first is realized the selection and mixing of different types of aluminium scraps, whose chemical composition has to be as close as possible to that of the desired alloy. Then the aluminium scraps are set, through the loading porthole (2), in the rotating furnace without addition of sodium chloride as cover agent to prevent the oxidation of the metal.

Because of the rotation of the furnace and the special inside conformation, is obtained the mechanical remixing of the scrap in fusion with, simultaneously, an action of

carried of the material by the walls of the furnace. The metal gradually melts and the liquid aluminium begin to rotate in the same sense of rotation of the furnace; it will always be positioned in the low part of the furnace, because the force of gravity is higger then the carry force due to the rotation. Moreover, because of the rotational movement, joined to the inside inclination of the furnace, the liquid metal continually slide to the drawing hole (4) that is put in the lowest point, flowing through the small channels (12) transversally set to the spires of the body (11).

The liquid metal is protected against the oxidation of the air because of its low position, it is not directly licked up by the stream of the warm gases (whose flow is horizontal and situated in the tall part of the furnace), and because it continually flow in the basin (16) where the fused metal is stored, through the pouring channel (13). The slags remains in the tall part and are held by the spiral body (11) and, once all the aluminium is melted and has been stored in spherical basin, are discharged close to the loading porthole through a channel equipped with a cochlea, finishing the process of melting.

The slags, put in the channel and pushed by the cochlea, reaches the module of selection wherein they enter from the extremity (18). The module of selection is constituted by three hollow metallic and coaxial cylinders, one inserted in the other, and open to the left end, and is kept in horizontal position by booms (19) and metallic traverse frames (20) that place and creep on the slides (21) joined on metallic supports (22) with the interposition of a gear carriage (23).

The cylinders (24) and (25) have the surface side equipped with holes, greater on the first cylinder (24) and smaller on the second (25) so that it is possible the pouring of slags of different dimensions. The whole, constituted by the three cylinders, has put in slow rotation around the longitudinal axle, so have a remixing of the slags as soon as

they advance along the cylinders pushed by the cochlea. The slag, according with their weight and dimensions, passes from the first cylinder (24) up to the last one (26). Actually, in the first cylinder (24), with smaller diameter, are the slags essentially constituted by iron parts, steel, copper, that is material that has few or not put through the process of fusion; in the second cylinder (25) are the slags of aluminium oxide, while in the third cylinder (26) are essentially the dusts. It is very interesting the fact that the slags, flowing, are selected as well as they are cooled. The slags, so treated, flow out of the extremities of the cylinders and fall in the channels (27), (28), (29) positioned everyone below a cylinder and, by a cochlea system present in every channel, are pushed, at almost ambient temperature, in the storage buckets.

The recovered aluminium oxide is recycled and joined to the feeding charge of fusion.

All the exhaust gases produced in the module of selection and recovery of the slag are carried, through canalizations, to the cap (30), and don't escape in the external environment.

It is very important that the module of selection and recovery of the slag is constituted by units, placeables on tracks, (31), so that they can be open for inspections and maintenance.

Even if it is not represented in the drawings, the furnace of fusion is also modular, put on carriages that are moved on tracks, to make possible the opening.

Other great innovation is the system of scavenging, constituted by two separate canalizations. The warm gases, originated by the furnace of fusion at a maximum temperature of 300°C, are carried through the pipeline (32) in the underground pit (33) accessible by a porthole of inspection (34). The gases exclusively escape from the furnace of fusion, because of the concomitant action due to the kinetic energy (that originates from their heat), to the expansion that they have by reaching the pit (33), to

the loss of pressure produced by the chimney (35) and to the drag force produced by the air flow, at a great speed, that escapes from the extremity (36) of the pipeline (37). In the pit (33) the warm gases, because of the expansion, decrease in temperature and also realize a first falling of the heaviest particles of pollutant agents in the gases.

All the other gases that escape from the modules, having a lower temperature, are carried to the pipeline (37) by extractors, continuing in an underground pipeline (38) up to the chimney (35) equipped with various devices of cleaning of the dangerous gases for the environment according to the laws in force.

Both pipelines (32) and (37) are equipped with a control valve (39) for the automatic passage of the gases. The present system, besides the aforesaid advantages, realizes also an energetic conservation in the furnace of fusion, because the gases are evacuated in natural way and only in the quantity necessary to the process of combustion, not having additional quantities of heat for an excess of evacuation of the gases.

As previously described and illustrated, it is clear that the invention reaches the scope. Dimensions and shapes can be adjusted according to the demands.

Claims

1) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags, characterized in that it uses: a rotating furnace, internally equipped with a spiral element (11), that realizes the fusion of the aluminium not using a salty bath; a channel of pouring (13), realized with a suitable inclination and adequately contained in an insulated box (14) and equipped with a window (15) that is placed among the hole (4) of the rotating furnace and the spherical storage basin (16) positioned on a lower plan, in a pit, and equipped with a rotating joint (17) that realizes a continuity of inclination with the channel of pouring (13) so that to obtain the direct and continuous pouring of the fused metal in the tank; an automatic and continuous apparatus of selection and recovery of the slag of fusion directly integrated in the same plant; a double canalization of the exhaust gases.

2) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags, as claimed in claim 1, characterized in that the furnace for the fusion of primary and secondary aluminium (scraps), is constituted by a hollow cylindrical body (1), with circular section, whose inside diameter constantly varies along its longitudinal axle to originate a negative inclination on the horizontal line, beginning from the extremity where it is the loading porthole (2) up to the extremity where is positioned the hole (4), with plain slot, for the leakage of the fused metal.

3) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags , as claimed in claims 1 and 2, characterized in that the favourite negative inclination on the horizontal line of the furnace is two centimetres for linear meter of the length of the furnace.

4) Plant for the melting of primary and secondary aluminium and with screening and recovery of the slags , as claimed in claim 1, characterized in that the furnace is kept in

horizontal position by metallic traverse frames (5) that place and creep on the slides (6) held on metallic supports (7); on both the left and right extremities of the body (1) are the openings (8) and (9) for the escaping of the exhaust gases that flow in a single channel of evacuation (10).

5) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags , as claimed in claims 1, 2 and 4, characterized in that on the surface of the inside wall of the body (1) and along all its length, it is a spiral element (11), whose spires, cylindrical with circular section, with constant diameter and built in refractory material resistant against the heat and the mechanical stress due to the action of the scrap in fusion, have in the low part of the cylinder (1), close to the wall, a multiplicity of galleries or channels (12) with a favourite semicircular section.

6) Plant for the melting of primary and secondary aluminium and with screening and recovery of the slag , as claimed in claims 1 and 4, characterized in that the spires of the element (11) have an elliptical or polygonal section.

7) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags , as claimed in claims 1 and 5, characterized in that the galleries or channels (12) have whatever section, e.g. circular, elliptical or polygonal.

8) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags , as claimed in claim 1, characterized in that the rotating module of selection is constituted by three metallic hollow and coaxial cylinders, one inserted in the other, and open to the left end; the cylinders (24) and (25) have the surface side equipped with holes, greater on the first cylinder (24) and smaller on the second (25), so that in the first cylinder (24), with smaller diameter, the slag is constituted by material that has few or not put through the process of fusion, in the second cylinder

(25) it is the slag constituted by aluminium oxide, while in the third cylinder (26) they are essentially the dusts.

9) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags, as claimed in claims 1 and 8, characterized in that the selected slag flows out of the extremities of the cylinders pushed by cochlea and falls in the channels (27), (28), (29) positioned everyone below a cylinder and, by a cochlea system present in every channel, are pushed, at almost ambient temperature, in the store buckets.

10) Plant for the melting of primary and secondary aluminium with screening and recovery of the slags , as claimed in claims 1, 8 and 9, characterized in that the module of selection and recovery of the slag is constituted by units, placeables on tracks (31), so that it can be open for inspections and maintenance.

11) Plant for the melting of primary and secondary aluminium with screening and recovery of the slag , as claimed in precedents claims, characterized in that the process of melting consists in the following phases:

a) in case of favourite melting of secondary aluminium, is realized the selection and mixing of different types of aluminium scraps, whose chemical composition has to be as close as possible to that of the desired alloy;

b) the aluminium scraps are placed, through the loading porthole (2), in melting in the rotating furnace without addition of sodium chloride as cover agent to prevent the oxidation of the metal;

c) because of the rotation of the furnace and the special inside conformation, is obtained an action of mechanical remixing of the scrap in fusion, joined to an action of dragging by the walls of the same furnace;

d) the metal gradually melts and the liquid aluminium begins to rotate in the same sense of rotation of the furnace; it will always be positioned in the low part of the furnace, because the force of gravity is higher then the drag force due to the rotation;

e) the rotational movement, in association with the inside inclination of the furnace, will provides that the liquid metal continually flow toward the drawing hole (4) that is set in the lowest point, passing through the small channels (12) transversals to the spires of the body (11);

f) the liquid metal is protected against the oxidation, because it is very lower then the stream of the warm gases and because it continually flow in the storage basin (16) through the channel of pouring (13);

g) the slag remains in the tall part, and is held by the spiral body (11) and discharged close to the loading porthole; from there it reaches a channel equipped with a cochlea, that pushes them until the extremity (18) of the module of selection;

h) the slag are shared, according to dimension and weight, in inert and ferrous material (having an high point of fusion), in aluminium oxides and dusts and introduced, automatically, in the respective channels, equipped with a cochlea; from there it flows into the store buckets;

i) the recovered aluminium oxide is recycled to integrate the feeding charge of fusion.

12) Plant for the melting of primary and secondary aluminium with screening and recovery of the slags , as claimed in claim 1, characterized in that the warm gases that originate from the furnace of melting, at a maximum temperature of 300°C, are carried through the pipeline (32) in the underground pit (33).

13) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags , as claimed in claims 1 and 12, characterized in that the gases escape exclusively from the furnace of melting because of the concomitant effect of the

kinetic energy due to their heat, of the expansion that they have reaching the pit (33), of the loss of pressure produced by the chimney (35) and of the dragging produced by the air flow, having an high speed, that escapes from the extremity (36) of the pipeline (37).

14) Plant for the melting of primary and secondary aluminium with screening and recovery of the slags , as claimed in claim 1, characterized in that the exhaust gases that escape from the modules of selection and recovery of the slag and from the store basin, having a low temperature, are carried to the pipeline (37) by extractors, to continue then in an underground pipeline (38) up to the chimney (35).

15) Plant for the melting of primary and secondary aluminium, with screening and recovery of the slags , as claimed in claims 1, 12, 13 and 14, characterized in that both the pipelines (32) and (37) are equipped with a control valve for the automatic passage of the gases.

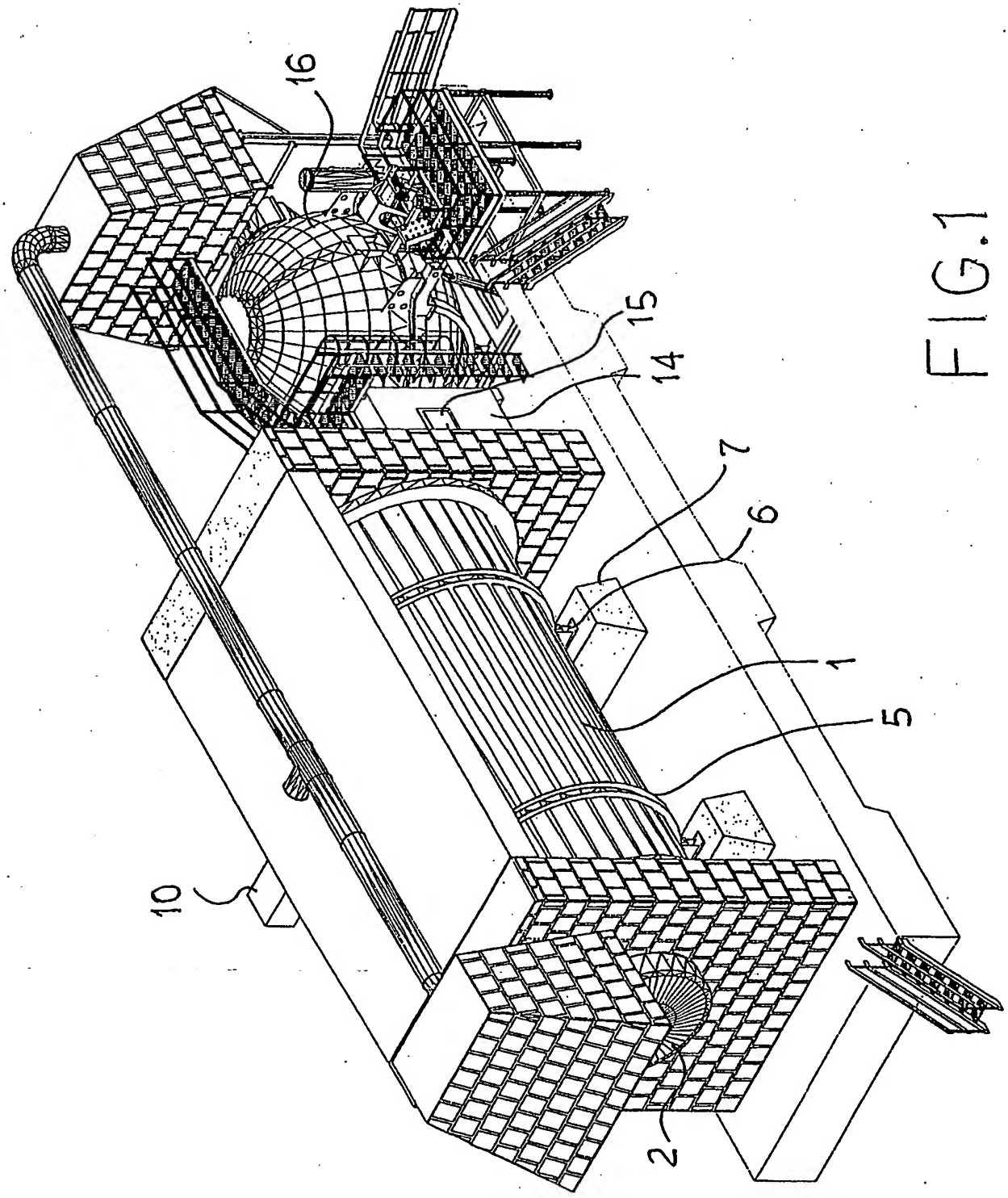


FIG.1

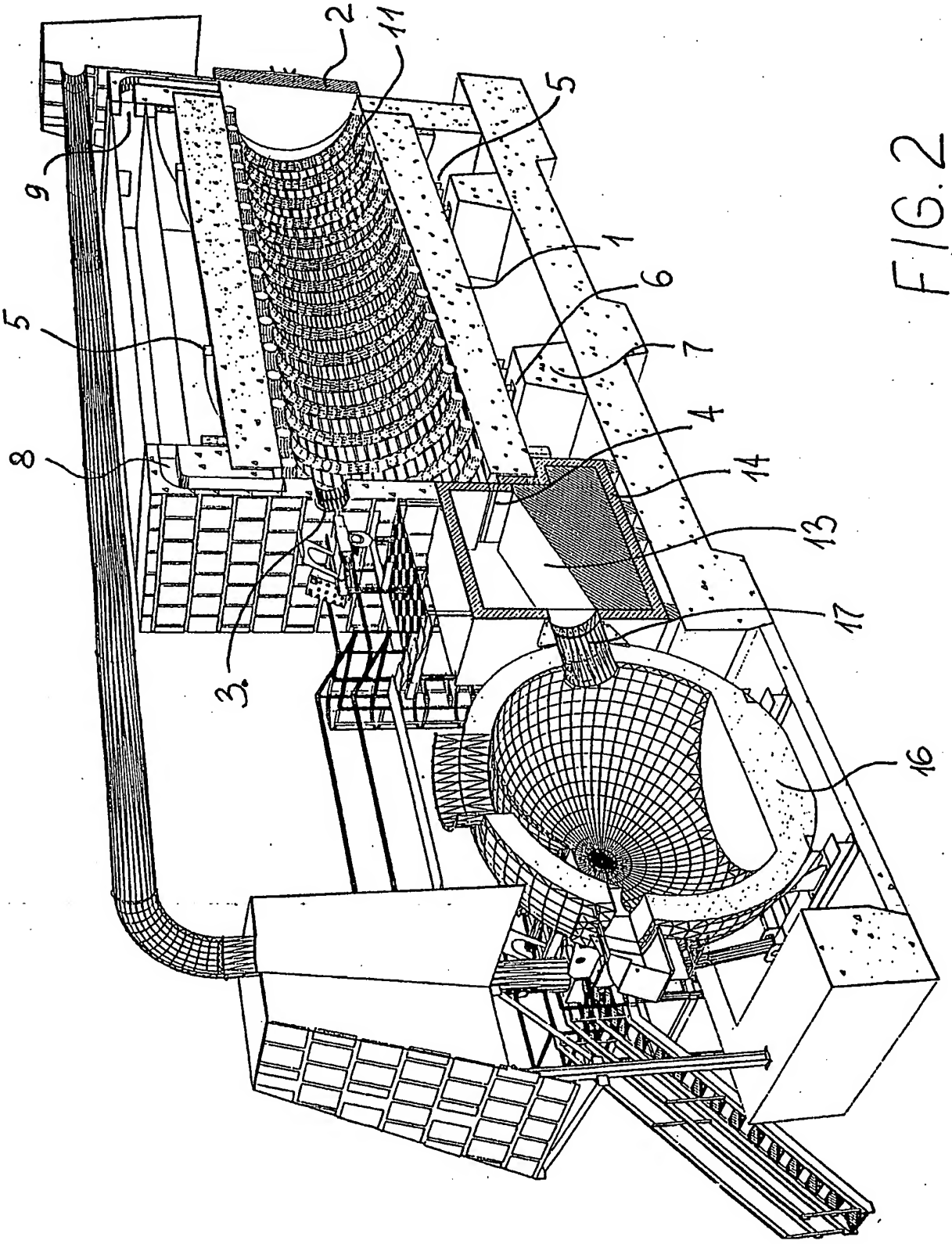


FIG.2

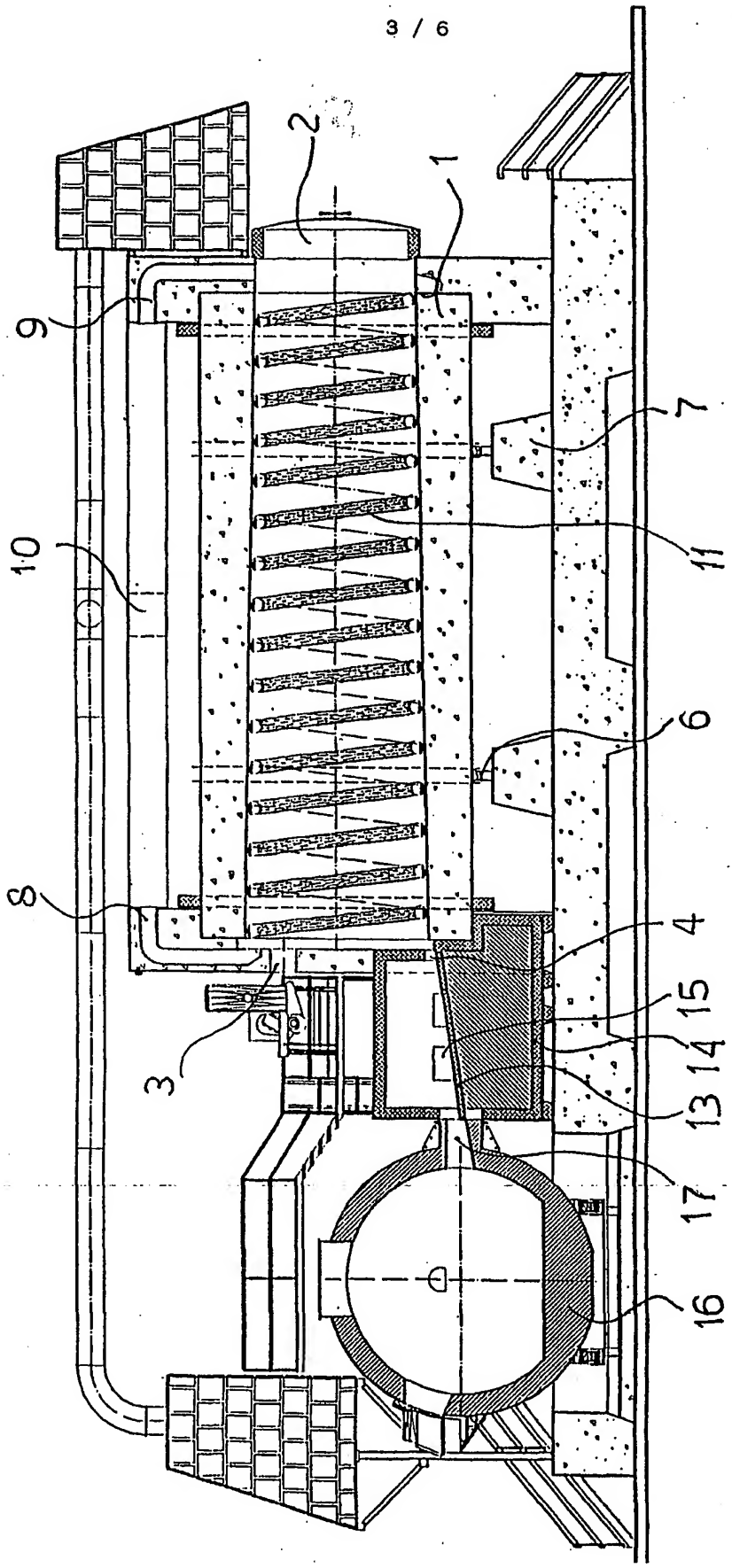


FIG.3

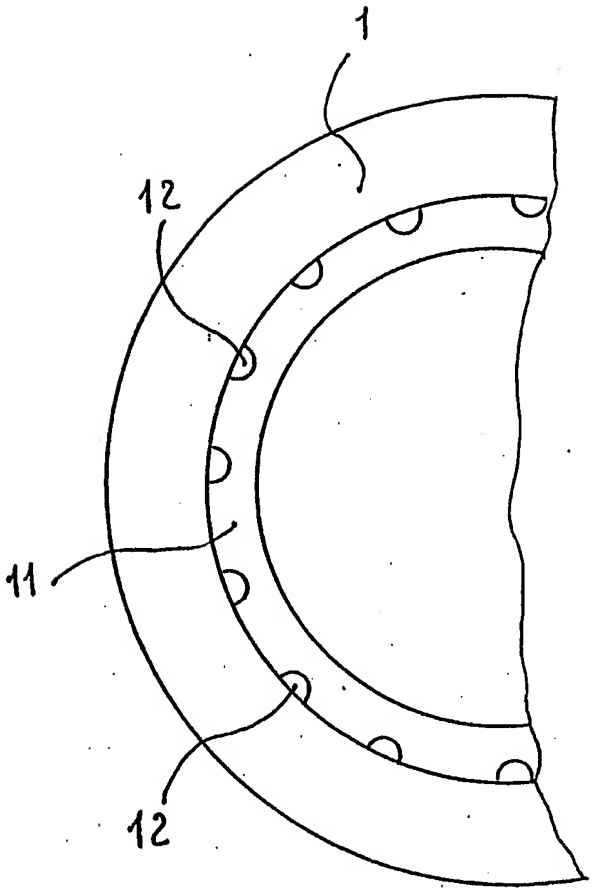


FIG. 4

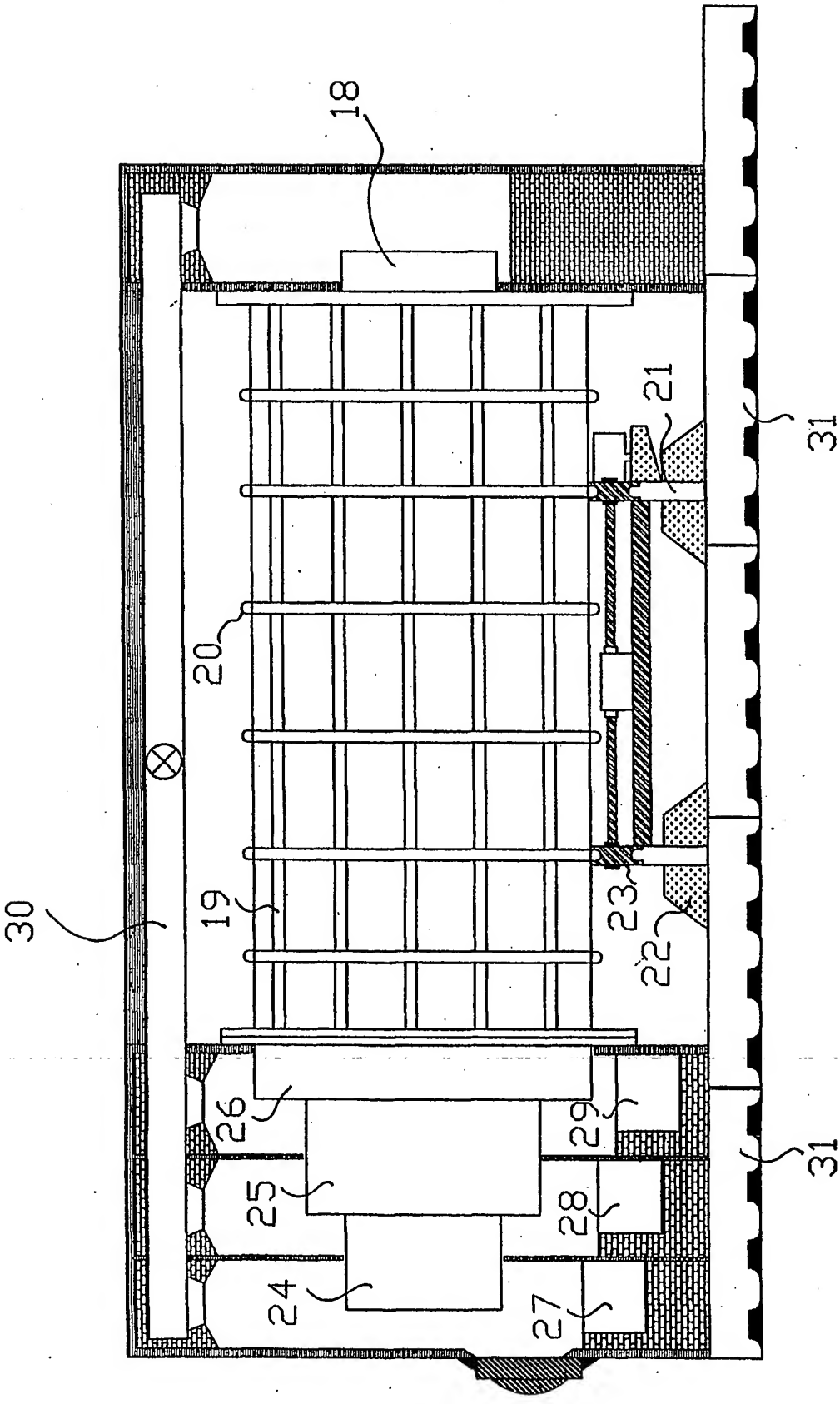


FIG. 5

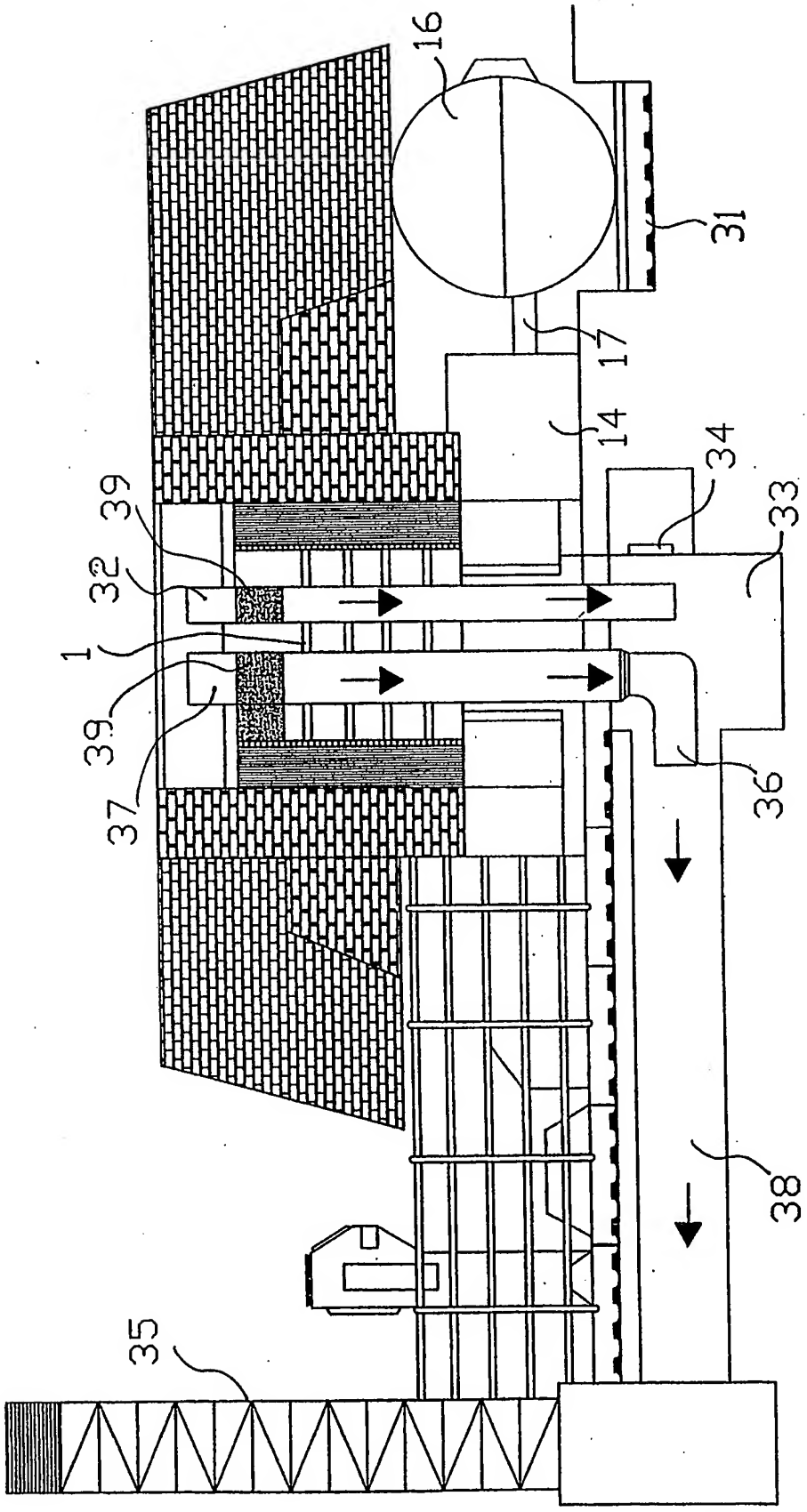


FIG. 6

INTERNATIONAL SEARCH REPORT

Interna ation No
PCT/IT 03/00862

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F27D3/14 F27B7/33 C22C1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F27D F27B C22C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 200 13 042 U (SUG SCHMELZ UND GIESANLAGEN GM) 21 December 2000 (2000-12-21) page 2, line 25 -page 3, line 15 figures 1,2 ---	1-15
A	UNLU N ET AL: "Comparison of salt-free aluminum dross treatment processes" RESOURCES CONSERVATION AND RECYCLING, ELSEVIER SCIENCE PUBLISHER, AMSTERDAM, NL, vol. 36, no. 1, July 2002 (2002-07), pages 61-72, XP004393588 ISSN: 0921-3449 paragraph '02.1!; figure 2 ---	1-15
A	EP 0 400 925 A (ALCAN INT LTD) 5 December 1990 (1990-12-05) abstract; figures 1-5 ---	1-15

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
26 March 2004	07/04/2004

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IT 03/00862

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 02 39044 A (SPOLETO ANTONIO) 16 May 2002 (2002-05-16) cited in the application abstract; figures 1,3	1-15
A	WO 02 101309 A (BRANCO FRANCESCO ;CATALANO ADRIANA (IT); GANDOLFO DONATELLA (IT);) 19 December 2002 (2002-12-19) cochlea of feeding (4) abstract; figure 1	1-15
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 14, 31 December 1998 (1998-12-31) & JP 10 244241 A (MITSUBISHI ALUM CO LTD), 14 September 1998 (1998-09-14) abstract	1-15
A	US 4 010 935 A (STEPHENS WILBUR E) 8 March 1977 (1977-03-08) abstract; figures 2,4	1-15
A	US 4 491 473 A (ZUBER CHESTER L ET AL) 1 January 1985 (1985-01-01) "screw or worm (52) to move the crap through the furnace", cf col.4, l.54-67 abstract; figures 2,3	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern. ation No
PCT/IT 03/00862

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 20013042	U	21-12-2000	DE	20013042 U1	21-12-2000
EP 0400925	A	05-12-1990	AT	121799 T	15-05-1995
			AU	626098 B2	23-07-1992
			AU	5599690 A	29-11-1990
			BR	9002527 A	13-08-1991
			DE	69018874 D1	01-06-1995
			EP	0400925 A2	05-12-1990
			JP	3215632 A	20-09-1991
			NO	902378 A ,B,	03-12-1990
			NZ	233835 A	25-09-1991
			US	5122181 A	16-06-1992
			ZA	9004115 A	29-05-1991
WO 0239044	A	16-05-2002	AU	2250702 A	21-05-2002
			CN	1394272 T	29-01-2003
			EP	1334324 A2	13-08-2003
			WO	0239044 A2	16-05-2002
WO 02101309	A	19-12-2002	IT	NA20010030 A1	09-12-2002
			WO	02101309 A1	19-12-2002
JP 10244241	A	14-09-1998	NONE		
US 4010935	A	08-03-1977	FR	2336649 A1	22-07-1977
			GB	1508935 A	26-04-1978
			IT	1067854 B	21-03-1985
			JP	1268567 C	10-06-1985
			JP	52080210 A	05-07-1977
			JP	59047015 B	16-11-1984
			SE	413547 B	02-06-1980
			SE	7608736 A	23-06-1977
US 4491473	A	01-01-1985	NONE		